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Google Scholar as a source for citation and impact analysis for a non-ISI indexed medical journal

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ABSTRACT

It is difficult to determine the influence and impact of journals which are not covered by the ISI databases and Journal Citation Report. However, with the availability of databases such as MyAIS (Malaysian Abstracting and Indexing System), which offers sufficient information to support bibliometric analysis as well as being indexed by Google Scholar which provides citation information, it has become possible to obtain productivity, citation and impact information for non-ISI indexed journals. The bibliometric tool Harzing's Publish and Perish was used to collate citation information from Google scholar. The study examines article productivity, the citations obtained by articles and calculates the impact factor of Medical Journal of Malaysia (MJM) published between 2004 and 2008. MJM is the oldest medical journal in Malaysia and the unit of analysis is 580 articles. The results indicate that once a journal is covered by MyAIS it becomes visible and accessible on the Web because Google Scholarindexes MyAIS. The results show that contributors to MJM were mainly Malaysian (91%) and the number of Malaysian-Foreign collaborated papers were very small (28 articles, 4.8%). However, citation information from Google scholar indicates that out of the 580 articles, 76.8% (446) have been cited over the 5-year period. The citations were received from both mainstrean foreign as well as Malaysian journals and the top three citors were from China, Malaysia and the United States. In general more citations were received from East Asian countries, Europe, and Southeast Asia.The 2-yearly impact factor calculated for MJM is 0.378 in 2009, 0.367 in 2008, 0.616 in 2007 and 0.456 in 2006.The 5-year impact factor is calculated as 0.577.The results show that although MJM is a Malaysian journal and not ISI indexed its contents have some international significance based on the citations and impact score it receives, indicating the importance of being visible especially in Google scholar.

Keywords: *Medical Journal of Malaysia*, *MJM*, *MyAIS*, Publication Productivity, Citation analysis, Impact Factor, Indexation Status.

INTRODUCTION

One way of determining how knowledge is transferred and used in science is by studying the literature published in the discipline, especially articles published in a group of journals or in a single journal. Scholarly Journals are social institutions that confers prestige and rewards to those associated with it. Authors who contributed to journals would be measured by their productivity and citability and this adds to their professional credentials among their peers (Tiew 1998; Chiu and Ho 2007). The journal appears to be the principal channel used by scientists to communicate theories, methods and empirical results (Sen

and Zainab 1996; Hashimah 1997; Schubert 2002). In the field of medicine, one approach to identify sound medical evidence is through publications in high-quality journals. It follows that the quality of a scientific article of today would depend on the prestige of the periodical in which it is published and the number of times the article is cited in literature (Cunha-Melo et al. 2006; Zainab 2006, Nwagwu 2007; Lee et al. 2010). This is based on the premise that frequently cited articles are most likely to have some influence and significance in a field than those less cited. Therefore, bibliometric analysis at the journal level can reflect the international nature of a research (Zitt and Bassecoulard 1997) and deemed suitable for bibliometric analysis (Tijssen et al. 2002). Bibliometrics has been defined as the quantitative analysis of literature, their references and citations (Borgman 1990; Durieux and Gevenois 2010). In this study bibliometric analysis is used to examine the *Medical Journal of Malaysia* (*MJM*), the oldest medical journal published in Malaysia in 1890.

LITERATURE REVIEW

Medical Journal of Malaysia

Medical Journal of Malaysia originated as the *Journal of the Straits Medical Association* (*JSMA*) which was published between 1892 and 1897. The Straits Medical Association was established by a group of medical officers who saw a need to form a professional body for medical practitioners in Singapore to discuss and research on local diseases and other medical subjects. The association noted that cooperative research and learning was important for the medical community and that the tropical climate of the region presented unique perspectives to the study of medicine (Chen 1982; Lim, 1995; Chia and Yeong, 2006). The association published its journal (*JSMA*) in March 1890 under the editorship of Max F. Simon (Dr) who was the Principal Civil Medical Officer of the Straits Settlements. Eighteen months after its establishment, the association's membership grew to 18 ordinary, 7 corresponding and 4 honorary members. The association held its preliminary meeting on 11 March 1890 and during the meeting, it was proposed that the society be called the Straits Medical Society and a committee was appointed to draft rules for the society. On 22 April 1890 the Straits Medical Association was formally adopted as the society's name. The first office-bearers were also elected and sixteen association rules were accepted. On 1 January 1894, the association was admitted as a branch of the British Medical Association and became known as the Malaya Branch of the British Medical Association. The assets and liabilities of the Straits Medical Association, including the library and museum, were transferred to the newly formed Malaya Branch of the British Medical Association (Chia and Yeong 2006).

In light of this new development, the publication of the *Journal of the Straits Medical Association* (*JSMA)* was discontinued. However, it was later revived in 1904 as the *Journal of the Malaya Branch of the British Medical Association* (1904 - 1907). Due to lack of contributions, the journal could not sustain its publication and ceased temporarily. Some of the names under which the journal was published includes the *Malaya Medical Journal* (1911 - 1912), the *Transactions of the Malaya Branch of the British Medical Association* (1922 - 1923), the *Malayan Medical Journal* (1926 – 1937), the *Journal of the Malayan Branch of the British Medical Association* (1937 - 1941), *Medical Journal of Malaya* (1946 - 1971) and *Medical Journal of Malaysia* (1971 - present) (Chen 1982; Lim 1995*;* Chia and Yeong 2006). *MJM* is the oldest medical journal in the country and one of the oldest in the region. It is published quarterly and can be found in medical libraries in many parts of the

world. *MJM* is indexed in *Index Medicus*, the internationally accepted reference index for medical journals. It is however not covered by the *ISI* databases (*Science Citation Index* or *Social Science Citation Index*). Being the oldest journal, it is felt that a thorough study of the journal is appropriate to understand the trend and growth of medical article publication activity in Malaysia.

Journal Citation Analysis and Medical Literature

Books, monographs, reports, theses and papers in serials and periodicals are units of bibliometric analyses. The scientific paper published in refereed scientific journals has proven to be a suitable unit for bibliometric studies (Glanzel 2003). This is as a result of factors such as the reviewing system, the criterion of originality of research results, the availability and visibility of literature and the transparent rules that control journals' publication processes.

At the journal level citation analysis and impact factor are bibliometric measures often used. Citation analysis may involved studying the references used by authors when shaping their articles (Hashimah 1997; Gomez 2002; Al-Qallaf 2003; Omotayo 2004) the core journals that are listed in the articles were subjected to Bradfor's Law of Literature Scattering (Bradford 1948; Porter 1988; Delwiche 2003; Crawley-Law 2006), the age of the sources used (Crawley-Low 2006; Larsen 2008) and the language of sources used (Macías-Chapula and Mijangos-Nolasco 2002). Citation analysis may also involved studying the citations received by articles published in journals to determine the influence or citedness in a field (Fan and McGhee 2008, in cataract and LASIK literature; Morley and Ferruci 2008, in Geriatrics literature) and visibility and performance of a country's journal (Davarpana and Behrouzfar 2009, on Iranian national journals; Wang et al. 2007, on Chinese scientific journals).

Only two studies were located that applied bibliometric method to Malaysian biomedical and health science literature. Hashimah (1997) examined *MJM* (1990-1995) and used citation analysis to investigate information sources used by Malaysian medical authors for the purpose of obtaining information to improve the collections and services in the University of Malaya's medical library. She reported that journals constituted 82.8% of the publication format used by medical authors and researchers. The top four most frequently cited authors came from local institutions and 81.8% of the citations were 18 years old or less. Publications in English were relied heavily by Malaysian medical professionals. A total of 853 journal titles were cited and majority of them were published in the more developed countries. Ranking of journals by number of citations shows that 14.77% titles account for 55.48% of total journal citations. The outcome of the study revealed that bibliometrics research techniques are necessary for future planning and selection of journal titles in the library's collection. Hazmir (2008) applied bibliometric method to Malaysian biomedical and health sciences publications in the *ISI Science Citation Index* (SCI) database from 1990 to 2005. He reported that Malaysian biomedical and health sciences are becoming a fast growing research field; the most productive period was during the 8MP (Eight Malaysian Plan) and the trend line indicated a continuing upward trend. Journal articles (73.3%) were the main type of publications produced. More than half (63.7%) of authors (4,178) were onetime contributors. Fifteen authors were identified as the most productive, producing an average of 2.7 papers each per year; The majority of publications were multi-authored (89.3%) works; Institutions of higher learning especially from the public sector, dominated the production of research publications. A total number of 2,413 (63.5%) joint papers were identified and 47.4 percent were the result of international collaboration; Clinical Medicine is the most actively researched area. Even though

Hashimah studied *MJM* she does not looked at *MJM's* citedness and impact factor. In this study the visibility of *MJM* is being examined to determine how this journal, which is not covered by the ISI databases, manage to derive citation and impact count by making itself visible.

OBJECTIVES

This study aims to apply bibliometric analysis such as citation count and impact factor to articles published in the *Medical Journal of Malaysia* (*MJM*) between the years 2004 and 2008. The 5-year data was harvested from an open access database, *Myais; Malaysian Abstracting and Indexing System (http://myais.fsktm.um.edu.my),* which provides sufficient data to support a bibliometric study related to Malaysian medical related authors and their works. *MJM* issues published within the 5-year period is fully covered by *MyAIS*. *MyAIS* indexes scholarly journals published in Malaysia and has improved the dissemination, retrieval and visibility of Malaysian journals (Zainab 2006). The database currently indexed over 30 medical and health science journals published in Malaysia, among which is the *Medical Journal of Malaysia* (*MJM*). The database's contents is also indexed by *Google Scholar*. Hence, the objectives of this study are to determine the following.

(1) To examine the articles productivity of *Medical journal of Malaysia* from year 2004 to 2008.
(2) To find out the country affiliation of contributing authors to determine the extent of international contributions.
(3) To examine the pattern of citations received by articles published in *Medical journal of Malaysia* through:
    (a) Total citations received for articles published between years 2004 and 2008 from *Google Scholar*.
    (b) Journal self-citations.
    (c) Type of documents citing *MJM.*
    (d) Scholarly journals citing *MJM* between years 2004 and 2008.
    (e) Countries Affiliations of authors citing *MJM* between years 2004 and 2008.
    (f) Journal impact factor of *MJM a*rticles published from year 2004 to 2008.

METHODOLOGY

Bibliometrics is the procedure adopted in this study, using data obtained from an open access database *Myais (Malaysian abstracting and indexing system) (http://myais.fsktm.um.edu.my/),* which provided large datasets that make possible analyses at a scale that cannot be achieved by traditional methods such as survey and case studies (Borgman, 1990). The database is sufficiently comprehensive for this study. The process followed a very carefully planned step by step approach. The first step is the process of extracting data from the bibliographic databases *(Myais)* and uploading them according to specified set of fields. The second step involves a thorough data clean up; a very necessary task due to errors resulting from misspellings, incomplete or wrong addresses, publication year and incorrect citations. The next step is to code each field according to the significant variables at which content behavior is being observed (papers

or country contributions, etc) and use these variables to make comparisons in line with the objectives of the study.

All articles published in the *Medical Journal of Malaysia* from year 2004 to 2008 serves as the sample for this study. The study examines articles published within a 5 year period, since it should provide sufficient amount of data for analysis. So the cut off year 2008 is appropriate to return some citations (if any) by 2009. The number of articles retrieved for the purpose of this study was 580 articles. Citations to articles published in *MJM* is obtained from *Google Scholar,* which harvested *MyAis's* content. The bibliometric tool Harzing's *Publish or Perish* is used to collate citation information captured from *Google Scholar*. The distribution of authoring and citing countries was used to measure the influence of the journal (Zitt and Bassecoulard, 1998) as a publication channel for authors in the medical field. Subramanyam's formula (1983) is applied to calculate the *MJM*'s collaboration index, that is the proportion of co-authored publications in *MJM*. The formula used is as follows.

C = Nm / (Nm + Ns)
Where,
C =Degree of Collaboration
Nm = number of Multi-authored contributions
Ns = Number of Single Authored contributions.

MJM's impact factor is calculated using this simplified formula:
IF = A/B
where
IF = Impact factor
A = Citations received in year *x* to articles published in previous two years
B = Number of citable articles published in those previous two years.

And the five year impact factor is calculated as
A= Citations in 2009 to articles published between 2004 and 2008
B = Number of articles published between 2004 and 2008

RESULTS

Article Productivity of *Medical Journal of Malaysia*: 2004 - 2008

The number of articles published during the five-year (2004 - 2008) period is five hundred and eighty (580). Table 1 shows that article publications have consistently increased during the period under study, with an average of 116 articles per year. There were two peak periods observed in 2004 (139 articles) and year 2008 (135 articles). The distribution of articles in each year suggests that *MJM* have successfully maintained its publication consistency over the years and is expected to do so in the future

Table 1. Number and Percentage of Articles Published in *MJM* Per Year

Year	Number of Articles	Percentage (%)	Cumulative Percentage (%)
2004	139	23.97	23.97
2005	102	17.59	41.55
2006	104	17.93	59.48
2007	100	17.24	76.72
2008	135	23.28	100.00
Total	**580**	**100.00**	

Number of Contributing Authors per Publication Year

Two thousand one hundred and seventy seven (2177) names were identified from published articles contributing from different regions of the world. The number and percentage of contributing authors is given in Table 2. A total of 568 authors were the highest recorded in year 2008 and the least number of authors recorded was 352 authors in year 2007. As reflected by total number of publications the number of authors contributing jointly seems to be predominant as total authors nearly always double compared to the number of articles published. Using the Subramanyam's formula it was found that the degree of collaboration in *MJM* between years 2004 and 2008 is 0.9. This co-authorship pattern is similarly indicated by Macías-Chapula and Mijangos-Nolasco (2002), Al-Qallaf (2003), and Hazmir (2008) who observed that multiple authorship in medical and health science journals is a norm.

Table 2: Number and Percentage of Authors Contributing Articles Per year

Year	Number of Articles	Number of Authors	Percentage (%)
2004	139	478	21.96
2005	102	367	16.86
2006	104	412	18.93
2007	100	352	16.17
2008	135	568	26.09
Total	**580**	**2177**	100.00

Malaysian and Foreign Contribution based on Affiliation

The distribution of authors distinguished as Malaysian and foreign was used to indicate the journal's influence as a channel of communication by authors in the medical field. Table 3 illustrates the distribution of Malaysian and foreign contributors per year to *MJM.* In all, 91.04% (1982) authors were affiliated to Malaysia, while 8.96% (195) were foreign.

Table 3: Malaysian and Foreign Authors Contribution Per Year Based On Affiliation

Year	Malaysian	Foreign	Total
2004	438	40	**478**
2005	334	33	**367**
2006	394	18	**412**
2007	324	28	**352**
2008	492	76	**568**
Total	**1982 (91.04%)**	**195 (8.96%)**	**2177**

Table 4 shows the characteristics of collaboration among Malaysian or foreign contributors only and also joint contribution by either Malaysia with foreign or foreign with foreign authors.

Table 4: Number of Malaysian and Foreign Collaboration per Year

Year	Purely Malaysian	Collaboration with foreign	Purely Foreign	All Foreign
2004	126	3	10	13
2005	90	7	5	12
2006	95	6	3	9
2007	90	5	5	10
2008	115	7	13	20
Total	**516 (88.96%)**	**28(4.82%)**	**36 (6.20%)**	**64(11.03%)**

Collaboration was active mainly amongst authors from various institutions within Malaysia not with those from foreign institutions.

In summary, Tables 3 and 4 revealed that:

(a) Most of *MJM* contributors were Malaysians. As such *MJM* did fulfill its objective of being the channel for Malaysian medical researchers, scientists, academicians and practitioners to publish in.

(b) It is also assumed that the subject coverage of articles reflected issues that plagued Malaysia. Analysis of keywords in articles published revealed high frequency of words such as diabetes, cancer, endoscopy, hypertension, tuberculosis, and so forth. Keywords also indicated a tendency towards finding solutions to combat and control diseases in Malaysia or the states within Malaysia.

(c) The country affiliations of contributing authors indicate that *MJM* does not fit into the characteristics of an international journal. The composition of contributing authors in a journal is felt to be an important characteristic in the internationalization of journals and has been discussed in literature. Elster and Chen (1994) studied international contributions to the *American Journal of Roentgeology* (AJR) and indicated an increment of international submissions and a decrease in the contributions from the United States and Canada. Roger (2001) and Jenkins (2001) verified this situation. Jenkins (2001) found that *AJR* received more submissions from international authors than from those residing in the United States. Ozsunar et al. (2001) also observed this condition for the journal *Radiology*, which indicated 405 contributions from international authors for articles published in 1999. Chen, Jenkin and Elster (2003) revisited the *Journal of Roentgenology* and looked at articles submitted between 2000 and 2002 and found that international contributions amount to 37% (602/1624). This situation is validated by Tompkins, Ko and Donovan (2001) who studied all articles published in 1983, 1988, 1993 and 1998 in 5 US and 1 UK surgical journals. The results from viewing 4868 article in the US journals and 1380 articles in the British journals found an increase in the total of British journal articles by 58.0% and the percentage of US articles decreased from 87.5% to 68.8% in the US journals. Alternatively, the percentage of British articles also decreased from 74.8% to 47.0% in the British journals. This indicates that as journals become "international" it will lose some of its "local" characteristics and one would see an increase in international contributions and coverage of subjects of international interests. *MJM* did not reflect this "international" characteristic.

Hence, if *MJM* is a national journal and not indexed by the *ISI* databases, does it mean that it has little influence in medical literature. How can its influence and impact be measured? This is made possible because of its visibility through *MyAIS* and subsequently *Google Scholar*.

Citations Received by *Medical Journal of Malaysia (MJM)*

(a) Citations Received between 2004 and 2008

The citation analysis in this context refers to the frequency with which papers published in a journal are cited in other papers (Chiu and Ho 2005). Traditionally, the most commonly used source of bibliometric data is the *Thomson ISI Web of Science, Science Citation Index* and the *Journal Citation Reports* (*JCR*) databases, which provide the yearly Journal Impact Factors (JIF) (Harzing and Van der Wal 2008). Recently, an alternative source of data is

being presented by *Google Scholar*, which is a good alternative for journals that are not ISI-indexed. It appears to be strongest in the sciences, particularly medicine, and secondarily in the social sciences (Vine 2006). Šember, et al (2010) analyze the 2007 citation count of articles published by the *Croatian Medical Journal* in 2005-2006 based on data from the *Web of Science*, *Scopus,* and *Google Scholar*. The study observed that the *Web of Science* databases covered the highest-impact scientific journals as the source of citation for the *Croatian Medical Journal*, but that the coverage by *Scopus* and especially of *Google Scholar* was broader and included additional local sources. Therefore, since *MJM* is not included in the journal citation report, citations retrived from *Google Scholar* is employed using the free bibliometric tool *Harzing Publish or Perish* (http://software.informer.com/getfree-harzing-publish-or-perish/) which harvests data from *Google Scholar* and provide structured bibliometrics information, that includes, total citations received by a journal and the journal's impact analysis. Table 5 shows the total number of citations received by *MJM* between 2004 and 2008. From Table 5, we could see that out of the 580 articles published by *MJM* between 2004 and 2008, 76.8% (446) have been cited at least once. This implies that *MJM* articles are appealing to local and international researchers who are citing the articles it publishes.

Table 5: Citations Received by *MJM* Articles Published between 2004 and 2008.

Publication Year	No of *MJM* articles cited	Year Cited (No of times)	Total Citations
2004	129	2004 (10); 2005 (39) 2006(82); 2007 (93) 2008(100); 2009 (80); 2010 (48)	452
2005	102	2005(2); 2006 (28) 2007(62); 2008 (72) 2009(73); 2010 (31)	268
2006	102	2006(7); 2007 (65) 2008(61); 2009 (93); 2010(94)	270
2007	56	2007(1); 2008 (14) 2009(54); 2010 (32)	101
2008	57	2008(7); 2009 (35) 2010(31)	73
5-years	**446**		**1164**

(b) Types of Documents Citing *MJM*

The study noted that *MJM* articles were cited in scholarly journals, students' theses, dissertations, books, conference presentations and government publications (Table 6). The results indicate that *MJM* received approximately 93% (1082 citations) of its total citations from journal articles.

Table 6: Types of Documents Citing *MJM* Articles Published between 2004 and 2008

	Bibliographic format	Frequency
1	Journal articles	1082
2	Thesis and Dissertations	40
3	Books and Book Chapters	22
4	Conference proceedings, meeting, seminar etc	11
5	Government publications, reports, statistics etc	9
	Total	**1164**

(c) Journals Citing Articles in *MJM*

The study also observed that *MJM* articles obtained citations from articles published in top international medical and health science journals such as *Journal of Bone and Joint Surgery, BMC , Journal of Biomedical Materials Research .* The journals with the highest frequency of *MJM* citations were *Malaysian Family Physicians*, *Chinese Journal of Clinical Rehabilitation* and *Singapore Medical Journal* (13). Out of the 67 journals citing *MJM* articles, 9 were pubished in Malaysia (Table 7). The result implies that articles published in *MJM* although mainly local in context have been found to be useful to researchers in the medical field as reflected by citations found both in Malaysian and foreign journals.

Table 7: Top Journals Citing *MJM* Articles Published between 2004 and 2008

No	Journal Title	No of times
1	Malaysian Family Physicians (Mal)	19
2	MJM (self-citation) (Mal)	17
3	Chinese Journal of Clinical Rehabilitation	14
4	Singapore medical journal	13
5	Journal of Bone and Joint Surgery	11
6	BMC	10
7	Journal of Biomedical Materials Research Part A	10
8	Asian Pacific Journal of Cancer	8
9	Malaysian Journal of Medical Sciences (Mal)	8
10	Journal of Pediatric Surgery	7
11	International Journal of Pediatric Otorhinolaryngology	6
12	Nature proceedings	6
13	Spine	6
14	World Journal of Gastroenterology	6
15	Bone	5
16	Current Opinion in Otolaryngology & Head & Neck Surgery	5
17	International Journal of Ophthalmology	5
18	Journal of Orthopaedic Surgery	5
19	Malaysian J Pathol (Mal)	5
20	Medicine	5
21	Otolaryngol Head Neck Surg	5
22	Pediatrics	5
23	Tissue Engineering	5
24	Acimed	4
25	Acta Otorhinolaryngol	4
26	China Orthopedic Surgery	4
27	Chinese Journal of Reparative and Reconstructive Surgery	4
28	Clinics	4
29	Knee Surgery, Sports Traumatology, Arthroscopy	4
30	Malaysian Orthopaedic Journal (Mal)	4
31	Patient Education and Counseling	4
32	Sotheast Asian J Trop Med Public Health	4
33	Virologica Sinica	4
34	*Arch Ophthalmol*	3
35	Artificial Cells, Blood Substitutes	3
36	ASEAN Journal of Psychiatry (Mal)	3
37	Asia Pacific Journal of Public Health (Mal)	3
38	Biomaterials	3
39	Biomedical materials	3
40	China Tropical Medicine	3
41	Chinese Medical Journal	3
42	Clinical Pediatric Surgery	3
43	Clinical Surgery	3
44	Emerging Infectious Diseases	3
45	European cells and materials	3
46	Fertility and Sterility	3
47	Inter j of social psychiatry	3
48	International Journal of Biomedical Engineering	3
49	International Journal of Surgery	3
50	Journal of Ayub Med Coll	3
51	Journal of Laryngology & Otology	3
52	Journal of Materials science	3
53	Journal of Neurosurgery	3
54	Journal of the University of Malaya Medical Centre (JUMMEC) (Mal)	3

55	Jurnal Sains Kesihatan Malaysia (Mal)	3
56	Laryngoscope	3
57	Marine biotechnology	3
58	Nepal Med Coll J	3
59	Nephrology	3
60	Ophthalmic Research	3
61	Organogenesis	3
62	Pak J Med Sci	3
63	Public health	3
64	Rev. CEFAC	3
65	Revista Colombia Médica	3
66	Saudi medical journal	3
67	Shanghai Jiaotong University J	3

(d) Countries Affiliation of Citing Authors

Authors from seventy six (76) different countries have cited articles in *MJM*. Most of the citing authors were from China (227), followed by Malaysia (171), United States (123), India (43), United Kingdom (40), Germany (35), Australia (35), Brazil (31), Spain (27), and Turkey (20). In general, *MJM* article*s* received more citations from East Asian countries (258 citations), Europe (212), Southeast Asia (187), North America (156), Middle East (66) South Asia (61), South America (50), Australia (35) and Africa (23) (Table 8). This may imply that research articles published in *MJM* were international in standard in terms of their contents and were able to convince medical peers around the world of the significance and has prompted them to cite.

Collaborations that involves 2 or more authors from different countries producing articles citing *MJM* is shown in Table 9.

Collaborations that involves United States citing *MJM* articles occurred (20 times), and United Kingdom (16). This result is supported by (Chiu and Ho 2005) who did a study on homeopathy research and noted that among all countries, the US, the UK, and Germany contributed the most not only in terms of publications but also in citations. Lee et al (2010) examined the effect of author and article characteristics on citation in economic research, and reported that articles written by authors in the USA or UK are roughly twice more cited than articles written by authors outside the USA or the UK. The reason as explained is that authors in the USA and (or) UK are exposed to more competitive environment, where promotion, salary and research grants are typically allocated based on research performance, making it easier to collaborate with colleagues abroad. Chuang et al (2007) examined stroke-related research in Taiwan and discovered that there was an over-reliance on the US as a collaborator, which has proven to be successful, but worried that this may limit future development of research in Taiwan. By these results, it is believed that research articles published in the *Medical Journal of Malaysia (MJM)* are found to be useful enough for researchers in other countries to cite.

Table 8: Countries Affiliations of Authors Citing *MJM* Articles Published in 2004 -2008

	Region	Countries	Total citations	Region Total
1	Africa			25
		Nigeria	9	
		Egypt	8	
		South Africa	3	
		Uganda, Tunisia, Kenya (1 each)	3	
2	North America			156
		United States	123	
		Canada	18	
		Cuba	10	
		Mexico	5	
3	South America			50
		Brazil	31	
		Columbia	9	
		Venezuela, Argentina (3 each)	6	
		Uruguay	2	
		Chile, Peru (1 each)	2	
4	Europe			212
		United Kingdom	40	
		Germany	35	
		Spain	27	
		France	21	
		Italy	17	
		Greece	11	
		Netherlands, Switzerland (10 each)	20	
		Russia	9	
		Portugal	5	
		Czech republic, Ireland, Poland, Slovakia (3 each)	12	
		Denmark, Serbia, Sweden (2 each)	6	
		Bolivia, Cyprus, Finland, Lithuania, Norway, Romania, Ukraine, Armenia, Austria (1 each)	9	
5	South East Asia			187
		Malaysia	171	
		Singapore	12	
		Thailand	2	
		Vietnam, Brunei (1 each)	2	
6	Australasia	Australia	35	35
7	South Asia			61
		India	43	
		Pakistan	10	
		Nepal	5	
		Bangladesh	3	
8	East Asia			258
		China / Hong Kong	227	
		Korea	14	
		Japan	11	
		Taiwan	6	
9	Middle East			66
		Turkey	20	
		Israel, Iran (12 each)	24	
		Saudi	8	
		Jordan	4	
		Iraq, Lebanon, UAE (2 each)	6	
		Kuwait, Oman, Qatar, Yemen (1 each)	4	
	Total			1048

Table 9: Countries Collaborations of Papers Citing *MJM* Articles

	Collaborating countries	No of citations
1	Japan and India and Brunei and Indonesia and Philippines and Malaysia	5
2	Luxembourg and Germany	3
3	UK and Mal	3
4	UK and US	3
5	US and Germany	3
6	France and US	2
7	Mal and Austria	2
8	Malaysia and Japan	2
9	UK and Netherlands	2
10	US and China	2
11	US and India	2
12	US and Israel	2
13	Argentina and Canada	1
14	Australia and Hong Kong	1
15	Belgium and Korea and china and Thailand and Malaysia and Taiwan and Switzerland	1
16	Bosnia and Herzegovina	1
17	Brazil and Portugal	1
18	Brazil and Portugal and turkey	1
19	Canada and Japan	1
20	Chile and US	1
21	China and Germany	1
22	Denmark and Netherlands and UK	1
23	Egypt and Belgium and Italy and Greece	1
24	Egypt and Saudi	1
25	France and Austria	1
26	France and UK	1
27	Germany and Austria	1
28	Germany and Vietnam and Gabon	1
29	Greece and Egypt	1
30	Greece and US	1
31	India and Nepal	1
32	India and Pakistan	1
33	India and UK	1
34	Iran and Canada	1
35	Italy and Germany	1
36	Italy and UK and Hungary and Belgium	1
37	Mal and Singapore	1
38	Mal and Singapore and Japan and Indonesia and Philippines and India	1
39	Malaysia and Korea	1
40	Netherlands and Switzerland	1
41	Oman and Malaysia	1
42	Peru and US	1
43	Poland and Austria	1
44	Kuwait and Pakistan	1
45	Spain and Costa Rica	1
46	Srilanka and Singapore	1
47	Sweden and Iran and Finland	1
48	Sweden and Norway	1
49	Switzerland and Singapore and US and Laos	1
50	Tunisia and Albania	1
51	UAE and UK	1
52	UK and Bangladesh	1
53	UK and Canada	1
54	UK and INDIA and US	1
55	UK and Iran	1
56	UK and Japan	1
57	UK and Qatar	1
58	UK and Scotland	1
59	UK and Sweden	1
60	US and Australia	1
61	US and Bangladesh	1
62	US and Belgium	1
63	US and Columbia	1
64	US and Iran	1
65	US and Italy	1
66	US and Qatar	1
67	US and Senegal	1

68	US and Spain	1
69	US and Thailand and china and France and Australia and Switzerland	1
70	Wales and Hong Kong	1
71	Algeria and Canada	1
	Total	**90**

(e) Journal Impact Factor

Journal citation measures is one of the most widely used bibliometric tools. They are used in information retrieval, scientific information, library science and research evaluation, and they are applied at all levels of aggregation (Glanzel 2003). Publication in a journal with high reputation or high JIF provides greater respect among peers (Sharma 2007). Using the IF formula explain under methodology, *MJM*'s Impact factor (Garfield 1999) was calculated for each year between 2004 and 2008 and for a five-year period and the results is indicated as follows.

For year 2009

89 = Citations in 2009 to articles published in 2007 and 2008
235 = Number of articles published in 2007 and 2008
IF = 89/235 = 0.378

For year 2008

75 = Citations in 2008 to articles published in 2006 and 2007
204 = Number of articles published in 2006 and 2007
IF = 75/204 = 0. 367

For year 2007:

127 = Citations in 2007 to articles published in 2005 and 2006
206 = Number of articles published in 2005 and 2006
IF = 127/206 = 0. 616

For year 2006:

110 = Citations in 2006 to articles published in 2004 and 2005
241 = Number of articles published in 2004 and 2005
IF = 110/241 = 0. 456

For Five year IF 2004-2008:

335 = Citations in 2009 to articles published in 2004 - 2008
580 = Number of articles published in 2004 - 2008
IF = 335 /580 = 0. 577

As shown above, the highest *IF* was recorded in year 2007 (0.616) followed by 2006 (0.456), 2009 (0.378) and 2008 (0.367) while for the five years *IF* we have 0.577. Therefore, the result above has shown that *Medical Journal of Malaysia (MJM)* has relatively good IF even though it is mainly a Malaysian journal with ove 80% Malaysian contributions.

CONCLUSION

The bibliometric study on *MJM* has highlighted the following.

a) *MJM* has proven to be an important channel for communicating research amongst Malaysian medical researchers and practitioners. Over the years including the 5-year span under study *MJM* has managed to sustain its publication with a consistent production of sometimes over 100 articles per year. This is indeed an impressive feat and it is undoubtedly the mouth piece of members of the Malaysian Medical Association. This is clearly indicated by the high contribution of

articles by Malaysian researchers and practitioners both in the institutions of higher learning, the hospitals, research centers and clinics.

b) The editorial members of *MJM* are mainly Malaysians from various medical related fields and institutions and this is reflected by the mainly Malaysian contributions to the journals. The journal published very few foreign contributions. This indicates that *MJM* is still very much a Malaysian-based journal reporting on issues and findings closely related to Malaysian medical problems. Even though it is being covered by *Index Medicus* it is not *ISI*-indexed since *ISI* prefers journals with a more international appeal. This is an area where *MJM* can be improved by extending the composition of its editorial members to include foreign experts so as to encourage more foreign contributions. Uzun (2004) examined the pattern of foreign authorship of articles, and international composition of journal editorial boards in five leading journals in the field of information science, and scientometrics and revealed that the number of foreign countries contributing in all journals have increased rapidly since 1996 which could be explained by the percentage of foreign members on the editorial boards of the journals. This also suggests that a formidable and balanced editorial board might have a positive effect on the composition of contributions to a journal. This is part of the criteria for a journal to be deem International in nature, if the journal exhibit high contributions from international authors, as well as articles published in a journal are referenced in published articles (Zainab 2008). Also, more international contribution is expected to lead to more output due to the sharing of ideas (Chuang et al. 2007). *MJM* has longevity, has an Asian approach but needs to adopt a more regional outlook to encourage more foreign contributions.

c) Even though *MJM* is a Malaysian journal, the articles it publishes have international appeal and influence as reflected by the character of citing articles. This is clearly indicated by the current study using citation data provided by *Google Scholar*. Articles in *MJM* are being cited by journal articles in a variety of journals both mainstream and local. *MJM* is contributing to medical literature as reflected by the citations it receives in each of the 5 years under study. The range of *IF* scores between 0.367 to 0.616 within the five years shows that MJM has some influence even though small compared to IF received by mainstream medical journals. Hence to say that *Medical Journal of Malaysia* has no significance because it is not *ISI* indexed and have no impact factor has proven to be wrong. *MJM h*as managed to make itself visible through its coverage by *MyAIS (Malaysian Abstracting and Indexing System)* and subsequently by *Google Scholar*. This shows that being visible is important. As a result of this visibility, *MJM* articles began to be picked up by global medical researchers, which eventually lead to citation. This also indicates the viability of using *Google Scholar* instead of total dependence on the very selective *ISI* databases for citation and impact factor information.

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